

100-223
SPECIAL HANDLING

X-223

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OK 6954

PROGRESS REPORT

Period of January 1 to 31, 1964

Contract No. AF 33(600)40280

SPECIAL HANDLING

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A F-101 FLIGHT TEST

Film Evaluation

Primary radar film was obtained on only one of the five flights this month. Range resolution was degraded on this film by a factor of two to one over recent efforts because of 400 cps on the Recorder range deflection coils.

System

Flights 94, 95 and 96 were unsuccessful because of an in-flight fuse failure in the +300 volt power supply. Erratic Recorder film transport prevented a radar recording on flight 92. In addition, there was a failure in an aircraft control system on flight 95.

The Recorder was operated in an altitude chamber at 45,000 feet to isolate the fusing problem. With the data-flash circuitry disconnected, the +300 volt fuse did not blow. It is suspected that a transient is being coupled from the data-flash circuit into the high voltage power supply and the dynamic focus circuit to cause the overload. Until this theory can be verified and a fix incorporated, subsequent flights will be made with the data flash circuitry disabled.

Recorder 6 was installed in the aircraft early in the month, but was replaced with Recorder 5 because of range trace jitter problems.

The first deliverable Receiver was installed and successfully flown on flight 96. Since then a deliverable Limiting IF amplifier has been installed, but not flown.

The new dual off-set Frequency Generator has been installed and the DFT modified to operate with it. No flights have yet been made with this arrangement.

Antenna pressure has been normal since the replacement of two leaking antenna modules last month.

Magnetic instrumentation of antenna accelerations and accelerometer network output signals has been installed to assist in the analysis of the motion compensation performance.

B PHASE II FLIGHT TEST

An antenna servo test was performed with the antenna installed and waveguide attached. Position error due to stiction and hysteresis measured less than $.03^{\circ}$. The dynamic error was approximately .67 degree per degree command at 1.0 cps, compared to 0.5 degree error per degree allowed by specification R1915. The position transducer linearity on the actuator is inadequate, approximately 0.3 degrees. Transducers being built to a new design may be ready by the start of flight test.

The antenna bearings for the final installation appear to be satisfactory. A slide rail bearing for the servo mockup was sent to the vehicle manufacturer for a nitriding treatment.

During tests in the vehicle, the flexing portion of the interconnecting waveguide cracked adjacent to a weld located close to the input flange of the antenna. Two similar sections of the waveguide have been strengthened and will be tested to assure adequate life. Shipment of the second set of interconnecting waveguide will be delayed until a fix is obtained.

C ENVIRONMENTAL TEST

Units were not available for any environmental tests this month because of composite tests on the frame and continuing F-101 flight test. Reports on the Antenna temperature and vibration and recorder vibration tests were completed. The rough draft of final report on environmental test is complete.

D RECORDER

Photographic tests performed on one of the CRT recording lenses, indicated no substantial improvement in image quality near the edges of the field with use of the field flattener. The Wollensak field flattener is probably overcorrecting.

Rulon spray, a dry lubricant, was applied to the fiber optic faceplate to reduce surface friction. No damage to 500 feet of film passed over the faceplate was apparent.

Kaiser power supply #9890 passed the acceptance test satisfactorily and is available as a spare. Temperature tests on this supply showed the ratio of ultor and focus voltage to vary 0.32% over the ambient temperature range of 0° to 60° C.

Recorder #5 was converted to transport thin film and tested to be ready for F-101 flying. The thin-base film type 4401, does not have the same emulsion characteristics as type 5401, the thick base film used up to now. Type 4401 requires that the lens be opened approximately one stop more than for 5401 to assure optimum exposure. Tests are underway to determine the optimum bias and lens settings.

E ANTENNA

As part of the electrical portion of the laminate seal study, 13 fabrics or laminates have been tested for slot detuning, indicated by power received at the load end of the array stick, and compared to an uncovered array stick. With the presently used Dupont ML fabric used as a control, six of the 12 new samples tested within acceptable limits.

Elevation and azimuth patterns indicate some improvement to the pattern shapes in a few samples. Gain measurements indicate that most of the fabrics will have a loss of 0.5 to 1.0 db more than the presently used ML fabric. More electrical testing is to be done before subjecting the fabrics to temperature-pressure life tests.

One module was assembled to test the bonding of ML fabric to the array stick without masking the slot area on the fabric. Tests show an improvement in elevation pattern shaping but a deterioration of azimuth sidelobe levels (from -15 to -13.5 db) and a loss of approximately 0.3 db in gain. To investigate the possibility of contamination causing the change in sidelobe levels, the module was disassembled and thoroughly cleaned before reassembly. This module will be soldered at all joints, tested again electrically, then subjected to temperature-pressure life test to determine any improvement in delamination.

F SYSTEM

Interference between the instrumentation and radar was determined by mounting the instrumentation rack to a simulated aircraft bulkhead on the forward end of a system dolly. Unit mounting and

accessibility was improved through changes to the Recorder mounting brackets, connectors and cabling, and recessing some instrumentation brackets.

Modifications in the radar required by the instrumentation and programmer are complete except for fabrication of the Recorder range bandpass test box.

Purity of the tracker reference frequency was improved in the Frequency Generator. Pass band of the Doppler Frequency Tracker was centered at 920 cps and tested satisfactorily. The Frequency Generator and DFT mixer were tested together and DFT operation checked on the system frame.

G FLIGHT TEST EQUIPMENT

The Flight Test Equipment was used to simulate targets of various separations and CRT grid biases on the primary film and supplied to the correlator designers for the purpose of determining correlator resolution and primary film density for optimum correlator operation.